CTEH CENTER FOR TOXICOLOGY AND ENVIRONMENTAL HEALTH, LLC

Arkema Organic Peroxide Facility

Air Monitoring

Crosby, TX

Air Sampling and Analysis Plan

Version 1.3

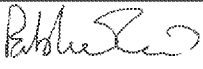
Prepared On Behalf Of:

Arkema

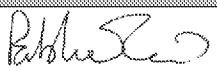
Prepared By:

Center for Toxicology and Environmental Health, L.L.C.
5120 Northshore Drive
North Little Rock, AR 72118

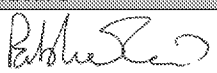
9/8/2017

Version 1.2			
	Name/Organization	Signature	Date Signed
Prepared by:	Pablo Sanchez Soria, Ph.D. – Project Technical Director		9/8/17
Reviewed by:	Jamie Beck – Project Manager		
Reviewed by:			
Approved by:			
Approved by:			
Approved by			
Approved by			

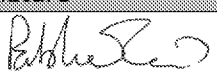
Change from version 1.0 to 1.1
Added SO_2 and NO_2 as target analytes. Corrected measuring range on MultiRAE Plus instruments.

	Name/Organization	Signature	Date Signed
Prepared by:	Pablo Sanchez Soria		9/1/2017
Review by:			
Approved by:			
Approved by:			
Approved by			
Approved by			

Change from version 1.1 to 1.2
Air Monitoring Plans for Worker Area and Site Characterization added

	Name/Organization	Signature	Date Signed
Prepared by:	Pablo Sanchez Soria		9/5/2017
Review by:	Jamie Beck		
Approved by:			
Approved by:			
Approved by			

Change from version 1.2 to 1.3
Added carbon monoxide as a target analyte for Work Area Monitoring due to the heavy presence of generators throughout the facility

	Name/Organization	Signature	Date Signed
Prepared by:	Pablo Sanchez Soria		9/8/2017
Review by:	Jamie Beck		
Approved by:			
Approved by:			

Air Monitoring and Sampling Strategy

CTEH® is focusing on the chemicals chosen below because they are among the most important and readily monitored hazards of this response. The possible hazards of this response vary by the source and type of the chemical as well as with the environmental conditions associated with the release. Monitoring and sampling for some chemicals or indicators of the presence of this response may be conducted less frequently or even discontinued as product-specific information becomes available or as initial monitoring and sampling results indicate that these chemicals and indicators do not pose a health concern.

The strategy is to utilize three broadly defined monitoring plans: **1)** Worker Monitoring **2)** Site Characterization and **3)** Community Monitoring. Workers may be designated as the individuals actively or sporadically involved in remediation and/or normal work activities within a Work Area generally with established site control zones (exclusion zone, contaminant reduction zone, support zone) where remediation activities are taking place. Site Characterization may involve a variety of different monitoring tasks intended to provide information that may help to delineate the nature and extent of the release (e.g. worst case determination, container head space, etc.) rather than monitoring for potential breathing zone exposures. Community Monitoring may take place in those residential and commercial locations surrounding the incident site, not necessarily currently occupied by members of the community.

Free-roaming handheld real-time air monitoring may be conducted in a variety of areas based on levels of activity, proximity to the release, and site conditions.

Discrete air samples may be collected in all monitoring areas and sent to an off-site laboratory for chemical analysis. These analytical air sampling techniques may be used to provide air quality data beyond the scope of real-time instruments. When necessary, discrete air samples may be collected on individual workers (personal sampling) to provide exposure data over the course of a work shift for more direct comparison to occupational exposure values.

CTEH Site-Specific Action Levels

CTEH® site-specific action levels may be employed in all air monitoring plans to provide information for corrective action to limit potential exposures. These values do not replace occupational or community exposure standards or guidelines, but are intended to represent a concentration limit that triggers a course of action to better address worker and public safety. Action level exceedances will be communicated to Site Management and the CTEH Project Technical Director by the CTEH Project Manager (PM). Work practice may be assessed and then altered if necessary. Site-Specific Action Levels are not utilized for Site Assessment monitoring.

Plan 1: Worker Monitoring

Objective: Report air levels before they reach those requiring respiratory protection

Analyte	Action Level	Action to be Taken	Basis	Instrument	Detection Limit	Notes	Correction Factor
Total VOCs	30 ppm sustained for 5 min.	Assess for the presence of benzene/toluene/hexane, Report reading to Site Management	To avoid over exposure to benzene/toluene/ hexane	MultiRAE AreaRAE	0.1 ppm	MultiRAE and AreaRAE Range: 0-5,000 ppm	NA
Benzene	2.5 ppm sustained for 5 min.	Sample as requested. Exit Area or don air purifying respirator; Report reading to Site Management or IC	ACGIH STEL Action level	UltraRAE	0.05 ppm	Change SEP tube frequently	NA
				Gastec tube #121L	0.05 ppm	Range: 0.1 – 65 ppm Volume: Variable	Var.
				MR Pro Sensor	0.1 ppm	Range: 0 – 100 ppm	NA
				Gastec tube #4LL	0.1 ppm	Range: 0.25 – 120 ppm Volume: Variable	Var.
Oxygen	<19.5%	Egress site or don supplied air respirator	Oxygen Deficient Atmosphere, as defined by OSHA	MultiRAE	0.1%	Range 0 – 30%	NA
Carbon Dioxide	5000 ppm sustained for 5 min	Egress site or don supplied air respirator	ACGIH TLV TWA	MultiRAE Sensor	100 ppm	Range 0 – 50,000 ppm	NA
LEL	10%	Egress site and report reading to site management	Industry Standard	MultiRAE, AreaRAE	1%	Range 0 – 100%	NA
Sulfur Dioxide	0.25 ppm sustained for 15 min	Sample as requested. Don full-face APR	ACGIH TLV TWA	MultiRAE sensor	0.1 ppm	Range 0 – 20 ppm	NA
Carbon Monoxide	25 ppm sustained for 15 minutes	Egress site and report reading to site management	ACGIH TLV TWA	MultiRAE Sensor	1 ppm	Range: 0 – 500 ppm	NA

Plan 2: Site Characterization Monitoring

Objective: Characterize nature and extent of release (Non-breathing zone, i.e. headspace monitoring; excavation/trench monitoring, etc. As requested)

Analyte	Action Level	Action to be Taken	Basis	Instrument	Detection Limit	Notes	Correction Factor
Total VOCs	NA	Report reading to Site Management	NA	MultiRAE, AreaRAE	0.1 ppm	Measuring range: 0 – 5,000	NA
Oxygen	NA	Report reading to Site Management	NA	MultiRAE, AreaRAE	0.1%	Measuring range: 0 – 30%	NA
Carbon Dioxide	NA	Report reading to Site Management	NA	MultiRAE sensor	100 ppm	Measuring range 0 – 50,000 ppm	NA
LEL	NA	Report reading to Site Management	NA	MultiRAE, AreaRAE	1%	Measuring range: 0 – 100%	NA
Sulfur Dioxide	NA	Report reading to Site Management	NA	MultiRAE sensor	0.1 ppm	Measuring range: 0 – 20 ppm	NA

Plan 3: Community Monitoring

Objective: Report air levels before they reach those that may be associated with nuisance or health concerns.

Analyte	Action Level	Action to be Taken	Basis	Instrument	Detection Limit	Notes	Correction Factor
Total VOCs	30 ppm 5 minutes	Assess for the presence of cumene. Report reading to PM	To avoid over exposure to volatile compounds	MultiRAE PID	0.1 ppm	Measuring range: 0 – 2,000 ppm	NA
Particulate Matter ($PM_{2.5}$)	0.138 mg/m^3 sustained for 15 min.	Report reading to project manager	Wildfire Smoke Guidelines for 1 hr avg. upper-bound breakpoint for unhealthy AQI	SidePak AM510	0.001 mg/m^3	PM2.5 impactor – 50% cut-off at 2.5 microns;	NA
Carbon Monoxide	75 ppm sustained 5 min.	Report reading to PM	PAC-1 value	MR Sensor	1 ppm	MultiRAE - Measuring range: 0 – 100 ppm	NA
Cumene	50 ppm uncorrected (92.6 ppm corrected) sustained 5 min.	Report reading to PM	PAC-1 value	MultiRAE PID	0.1 ppm	Measuring range: 0 – 2,000 ppm	0.54
				Gastec tube #122L	2 ppm	Measuring range: 2 – 100 ppm. 2 strokes** See image attached below	NA
Nitrogen Dioxide	0.5 ppm sustained for 5 minutes	Report reading to PM	AEGL-1 value (8-hr)	Gastec tube #9L	0.1 ppm	Measuring range: 0.5 – 125 ppm	NA

Analyte	Action Level	Action to be Taken	Basis	Instrument	Detection Limit	Notes	Correction Factor
				MultiRAE sensor	0.1 ppm	Measuring range: 0 – 20 ppm	NA
Sulfur Dioxide	0.2 ppm sustained	Report reading to PM	AEGL-1 value (8-hr)	MultiRAE sensor	0.1 ppm	Measuring range: 0 – 20 ppm	NA
				Gastec tube #5La	0.1 ppm	Measuring range: 0.5 – 60 ppm	NA
				Gastec tube #5Lb	0.01 ppm	Measuring range: 0.05 – 10 ppm	NA
				Gastec tuve #5LC	0.02 ppm	Measuring range: 0.1 – 25 ppm	NA

Cumene scale on tube 122L:

Tube 122L can also be used for other substances as below:

Substance	Correction Factor	No. of Pump Strokes	Measuring Range
Xylene	2	1, 2, 4	2 - 200 ppm

(1) Ethyl benzene

Ethyl benzene	1 3 5 10 20 30 40 50 60 70
Tube 122L Reading (n = 2)	2 5 10 20 30 40 50

(2) Cumene

Cumene	2 10 20 30 40 50 60 70 80 90 100
Tube 122L Reading (n = 2)	2 5 10 20 30 40 50

(3) Diethyl benzene

Diethyl benzene	25 10 20 40 60 80 100 120 150
Tube 122L Reading (n = 4)	2 5 10 20 30 40

Analytical Methods			
Analyte	Media/Can	Method	Notes
VOCs	Minicans	EPA TO-15 + TICS	

General Information on Procedures (Assessment Techniques) Used

Procedure	Description
Real-Time Hand-held Survey	CTEH staff members may utilize handheld instruments (e.g. MultiRAE, Gastec colorimetric detector tubes, etc.) to measure airborne chemical concentrations.
Analytical sampling	Analytical sampling may be used to validate the hand-held data monitoring data, or to provide data beyond the scope of the real-time instruments. Analytical samples may be collected as whole air samples in evacuated canisters or on specific collection media, and sent to an off-site laboratory for further chemical analysis.

Quality Assurance/Quality Control Procedures

Method	Procedure
Real-Time	• Real-time instruments may be calibrated in excess of the manufacturer's recommendations. ○ At a minimum whenever indicated by site conditions or instrument readings. • Co-located sampling for analytical analysis may be conducted, if necessary, to assess accuracy and precision in the field. • Lot numbers and expiration dates may be recorded with use of Gastec colorimetric tubes.
Analytical	• Chain of custody documents may be completed for each sample. • Level IV data validation may be performed on the first sample group analyzed. • Level II data validation may be performed on 20% of all samples. • Level IV data validation may be performed on 10% of all samples.
Reporting	• Daily Data Summaries may be provided for informational purposes using data that have not undergone complete QA/QC. • Comprehensive reports of real-time and/or analytical data may be generated following QA/QC and may be delivered 60 days following receipt of validated results, if applicable.

Glossary

Term	Definition
Sustained	Instrument reading above the action level continuously for the listed time period.
Excursion Limit	Whenever a reading exceeds a ACGIH® TLV reading by 5 times (if the chemical does not have a STEL or Ceiling based action level), exit the area and notify the PM
Breathing zone	The area within an approximate 10-inch radius of an individual's nose and mouth.
Ambient Air	That portion of the atmosphere (indoor or outdoor) to which workers and the general public have access.